

Amateur Radio Notes V

by Toshen, KE0FHS

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Diving into D-STAR – 3

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3) Putting it all together

Okay, time to roll up my sleeves.

3a) Programming the radio

If you're using a hotspot for D-STAR, it's really important that you set up your radio properly. For most simplex hotspot devices, DV mode won't work; instead, you must set up RPT1, RPT2, and a zero offset (either +/-0.000). This is known as D-STAR Repeater (DR) mode or Duplex mode.

The radio I use for D-STAR is the Kenwood TH-D74A. Because my write-up about setting up this radio for D-STAR is somewhat lengthy, I moved it to its own page: [Programming the TH-D74A for D-STAR ↗](#).

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3b) Booting up the hotspot

I ended up trying many different combinations of hotspot devices and software, and the steps to get each up and running is a bit different.

For detailed info about setting up a hotspot using Pi-Star, the app I'm currently using and highly recommend, see: [Playing with Pi-Star](#) .

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3c) First QSO via a reflector!

All the intense studying and hard work over the course of a couple weeks paid off when I was able to join my first D-STAR net! Using the settings below, I keyed up to link to a reflector and, once I heard that the reflector was free, a second time to announce myself. The hams on the net were kind enough to share some good advice with me and suggest a list of reflectors I can start linking to so that I can begin meeting hams around the world.

I'm ecstatic!

Here are the settings I used:

To link:

Mode: DR

Frequency: 438.600

Via Destination Select > Direct Input (URCALL):

UR CALL: XRF223BL

Via Repeater Select > MY Hotspot:

RPT1: KE0FHS B

RPT2: KE0FHS G

MY CALL: KE0FHS

To chat:

Everything is the same, except:

Via Destination Select > Direct Input (URCALL):

UR CALL: CQCQCQ

Viewing reflector or repeater status online

When you link to a reflector or DV repeater, it's typically possible to view the status online, as most reflectors and DV repeaters have active dashboards. For example, here's an old view of the XRF223 reflector's dashboard (*Note*: Since I first wrote this, Parker Radio has upgraded to a multiprotocol reflector, so their dashboard now looks different from the images shown here, but the idea is the same):

KOPRA XRF223 Dashboard

K0PRA XRF223 Reflector Network
Public IP - 208.73.201.157


Dashboard v1.14i Reflector 3.08

Module B linked to W0CFI analog FM repeater and EchoLink node K0PRA-L

Linked Gateways:

Module A	*Module B	Module C	Module D	Module E
	WB5PJB B			

Software Connected Users:



Callsign	Module	Type
KE0FHS	Listening	HotSpot
W0CFI D	Listening	HotSpot
KF5XK	B	HotSpot
N2SRK	B	HotSpot

Recently Heard Users:

NOTE: Callsign K0PRA is a transmission from W0CFI analog repeater or EchoLink node K0PRA-L

Callsign	Last TX on	Source	Date-Time MST
KF5XK	XRF223 B	KF5XK	2017-01-28 15:29:54
K2BBJ	XRF223 B	K2BBJ B	2017-01-26 22:55:55

In the Software Connected Users section, you can see that I'm linked to XRF223 with my hotspot and monitoring.

You also can see who has recently transmitted on the reflector. For example, once I transmitted, my listing in the Software Connected Users section changed to indicate that I'm linked to module B, and I also showed up in Recently Heard Users:

Software Connected Users:

Callsign	Module	Type
W0CFI D	Listening	HotSpot
KE0FHS	B	HotSpot
KF5XK	B	HotSpot
N2SRK	B	HotSpot

Recently Heard Users:

NOTE: Callsign K0PRA is a transmission from W0CFI analog repeater or EchoLink node K0PRA-L

Callsign	Last TX on	Source	Date-Time MST
KE0FHS	XRF223 B	KE0FHS	2017-01-28 15:38:25
KF5XK	XRF223 B	KF5XK	2017-01-28 15:29:54

Overall, a dashboard tells you how many people are linked to and active on a reflector. For example, I just looked at the REF001 Mega Reflector dashboard and found that more than 200 people are listed in the Software Connected Users section, and that there have been more than 40 Recently Heard Users in the last couple of hours.

The Recently (or Last) Heard Users section itself provides a good way to keep track of who is participating in a net.

Some dashboards also display the TX message of users, which often show their name and location. When the callsigns are bold and orange, that indicates a link, for example, to a user's [QRZ page](#) (as the XRF223 reflector does) or to a location (QTH) plotted on a map (as the REF001 reflector does).

Last Heard

Callsign	User Message	Last TX on	Time
KE0FHS	Toshen - Lyons, CO	C	2017/01/29 17:04:49
M0AUT	Dave Blackpool UK	C	2017/01/29 17:04:14
G4URG	SAM Blackpool UK	C	2017/01/29 17:03:55
G1CQF	PETE BRMGHM 2352532	B	2017/01/29 17:01:20
M1MCW	STUART, WALNEY ISLAN	C	2017/01/29 16:59:12
KM4BYT	Dwayne in Dallas GA	C	2017/01/29 16:47:54
KJ4VO	Mark - ATLANTA, GA	B	2017/01/29 16:24:12

Just search it – It's easy to find dashboards by searching for [reflector + dashboard], for example: xrf223 dashboard.

★ *A gotcha to be aware of: Direct Reply*

There's a D-STAR feature on the TH-D74A called Direct Reply. When a call has been received, the green Interrupt screen is displayed for a few moments. If Direct Reply is enabled, as long as the green Interrupt screen is displayed, you can initiate a direct reply to the caller by pushing PTT. However, this doesn't work if you're using a hotspot.



If you're using a hotspot and reply using Direct Reply, your transmission won't be heard. There are two ways to get around this: turn off Direct Reply (menu 612), or if you want to leave the feature enabled, press the [A/B] = OK button to close the Interrupt screen before pressing PTT.

A shout out to another Elmer, Mike, N0VF, for patiently testing with me in order to help figure this out. This is just one of the many things he has helped me figure out. Thanks, Mike!

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3d) Linking to a D-STAR repeater

In order to have a successful call between someone linked to a repeater from a hotspot and another person making an RF call into the same repeater, the RF caller needs to have their radio programmed with RPT 2 set to the repeater's gateway module G. Otherwise, they can hear the transmissions of the person calling in from the hotspot, but that person won't be able to receive their transmissions.

This makes sense: the person linked to the repeater from the hotspot is coming into the repeater by way of the gateway via the internet, and is transmitting out of the repeater on one of the other modules (for example, C). At the same time, the RF person is transmitting to and receiving from the other module (in this example, C), but in order for their transmission to reach the hotspot, it also needs to get out to the internet via the gateway (module G).

Here are two examples to illustrate this, using the DV Repeater KC0DS C, 145.3875.

My radio's setup (DV HT3)

In both of these examples, my radio, shown in the illustrations as DV HT 3, is set up as follows.

i) To link to the repeater via my personal access point:

Mode: DR

Frequency: 438.600

Via Destination Select > Direct Input (URCALL):

UR CALL: KC0DS CL

Via Repeater Select > MY Hotspot:

RPT1: KE0FHS B

RPT2: KE0FHS G <<<

MY CALL: KE0FHS

ii) To talk on the repeater after linking:

Everything is the same, except:

Via Destination Select > Direct Input (URCALL):

UR CALL: CQCQCQ

Successful example: using the gateway

Both DV HT 1 & DV HT 2 are set up to use the repeater via RF as follows:

Mode: DR

Frequency: 145.3875 –

Via Destination Select > *Direct Input (URCALL):*

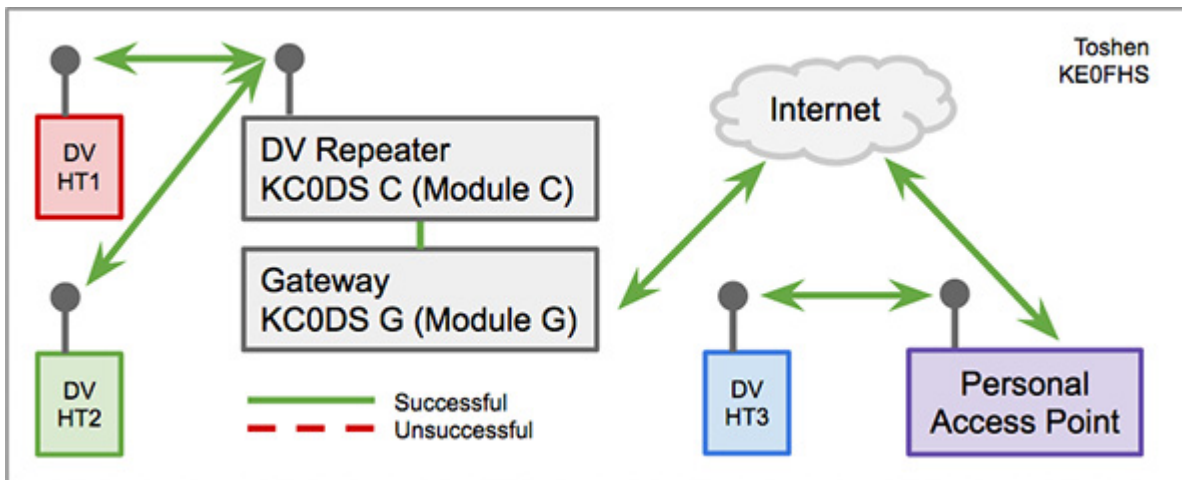
UR CALL: CQCQCQ

Via Repeater Select:

RPT1: KC0DS C

RPT2: KC0DS G <<< *Note this!*

MY CALL: Their callsigns



In this case, DV HT 1 and DV HT 2 can hear each other and DV HT 3, and DV HT 3 also hears them because they have set RPT 2 to use the gateway.

Note: This would not have worked if the UR CALL was set to CQCQCQ using the "Local CQ" option (found on the Kenwood TH-D74A; I'm not sure what the equivalent Icom option is).

Unsuccessful example: not using the gateway

Both DV HT 1 & DV HT 2 are set up to use the repeater via RF as follows:

Mode: DR

Frequency: 145.3875 –

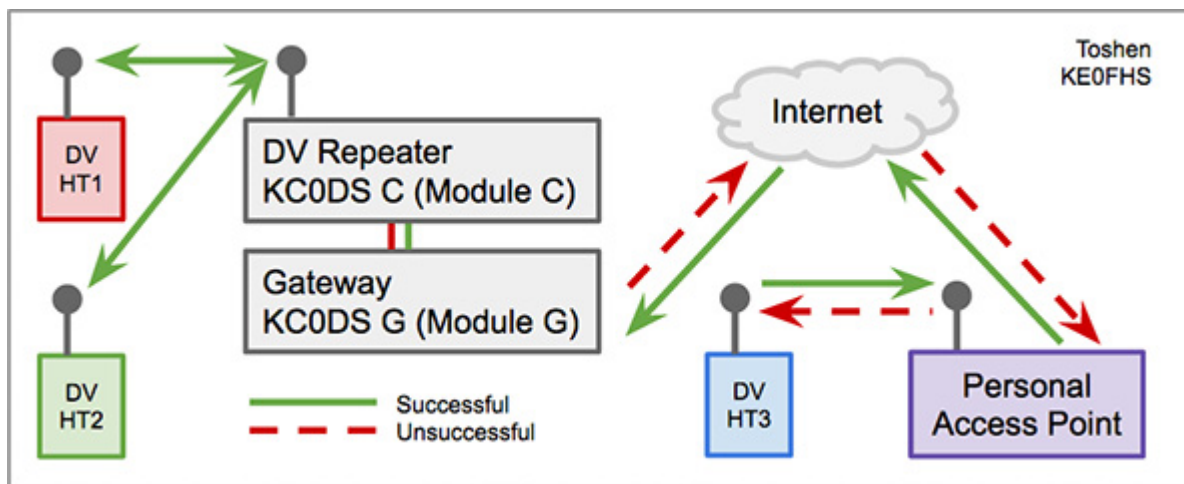
Via Destination Select > *Local CQ:*

UR CALL: CQCQCQ

RPT1: KC0DS C

RPT2: Blank or KC0DS C <<< *Note this!*

MY CALL: Their callsigns



In this case, DV HT 1 and DV HT 2 can hear each other and also can hear DV HT 3, but DV HT 3 can't hear them because they have not set RPT 2 to use the gateway.

The opposite holds true, too

If I program my radio, DV HT 3, so that it doesn't have RPT 2 set up to use the gateway (in other words, RPT 2 is set to Blank or KE0FHS B), I'll still be able to hear DV HT 1 and DV HT 2 as long as they're set up to use the gateway, but they won't hear my transmissions.

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3e) Just can't wait to get on the road again!

Here's one way you can have some digital voice fun while traveling.



Countryside road, fall season in Colorado
by f11photo, Shutterstock [↗](#)

There is a little (2"×1.5") board called the [BlueStack-Micro-plus](#) [↗](#) that you can mount under a same-sized DVMEGA board that is made for the RPi, but in this setup, the RPi isn't used. This photo shows a DVMEGA-DUAL mounted on the BlueStack.

This duo can be paired with an app called [BlueDV](#) [↗](#).

So far, I've used the BlueStack+DVMEGA+BlueDV combo while participating in D-STAR nets on an XRF reflector, as well as while chatting on London's REF001 C Mega Reflector. It works well.

Mode 1: Ser2net via USB cable. The BlueStack+DVMEGA duo can be connected via USB cable to a Windows PC running the BlueDV app. In this configuration, the power is provided from the PC's USB port. To use the BlueStack this way, its Serial Port to Network Proxy (ser2net) mode must be activated, which means the S1 switch (the red button) must be engaged (in the latched-in position).



Mode 2: Bluetooth. The BlueStack+ DVMEGA duo also can be connected via bluetooth to an Android phone running the BlueDV app. In this configuration, the power can be provided by a battery pack or a power supply. To use it this way, its Bluetooth mode must be activated, which means the S1 switch (the red button) must be disengaged (in the popped out position). When used with a battery pack, this is a good mobile solution. Most likely it also can be run off a cigarette lighter USB port, but I haven't tested that configuration yet.



I made a case for the BlueStack-DVMEGA duo
out of some mahogany scraps

On the road! I used this mobile solution to participate in a net while driving back along the foothills from the annual BCARES meeting in nearby Boulder, Colorado. It worked really well. The only issue I had was when I hit the one stretch along the highway where it goes between two hills (I always lose cellular service there). As I passed that stretch, I first heard a few seconds of R2D2-type garbled voice, and then I lost all audio for a few seconds, but the BlueDV app held onto the link, recovering nicely as soon as I was back in cellular range.

During the rest of the net, the audio was nice and clear in both directions (I've consistently heard from receiving stations that the audio from my TH-D74A over D-STAR is loud and clear with a good tone). I checked my data usage this morning (I use Google Fi) and it looks like I used only about 12 MB for the 40-minute net.

Thanks, The Netherlands! The BlueStack, DVMEGA, and BlueDV are made by various hams in The Netherlands. Individual boards and complete kits are available from [Combitronics](#) in Wernhout, and can be shipped internationally. (Now also available in the U.S. from Ham Radio Outlet.) There's information about the various versions of the BlueDV app, made by David, PA7LIM, on the [BueDV](#) website. [BlueDV for Android](#) can be downloaded directly onto an Android phone from the Google Play App Store.

The only limitation I've found compared to using the DVMEGA mounted on an RPi and running DStar Commander is that there's no way I've been able to discover to connect to a D-STAR repeater, only reflectors.

Another mobile solution

As of 2018, I also have another mobile solution for D-STAR (and DMR) based on Pi-Star and the ZUMspot board: [Mobile hotspot](#).

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3f) The tail end of the D-STAR tale ...

I thought my D-STAR story was headed for a fairy-tale ending, but I should've known better ... D-RATS tail got caught in D-TRAP!



Toon mouse

After installing the [D-RATS software](#) [↗](#) on my Windows PC and configuring it per the [D-RATS Operating Guide \(0.3.3\)](#) [↗](#), I attached my Kenwood TH-D74A to the PC via USB cable with a great sense of fanfare ... and then fell flat on my face.

I could see other stations signed into D-RATS and could receive their texts, but they couldn't see me and I couldn't successfully send texts to them.

Turns out my texts weren't triggering a PTT in my TH-D74A. But why not? After scouring the online forums, I learned in the Kenwood_TH-D74 Yahoo discussion group that there's a problem related to this with the TH-D74A (see the note: [Caveat: Kenwood TH-D74A shortcomings](#) [↗](#)). People have reached out to Kenwood about the issue, but as of late 2019 (firmware version 1.09), there has been no definitive answer back yet.

Rats!

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3g) Constellations: a big leap for digital voice

There was an interesting development that I learned about during 2017. When I introduced the three main digital voice systems at the beginning of this article, I said they were like side-by-side playgrounds, all with similar swing sets, slides, sandboxes, and climbers, but with arbitrary fences separating them.

If I understand things correctly, the XRF and XLX reflector systems are beginning to tear down those fences by enabling radios from different digital voice systems to connect to a "constellation" of reflectors.



Milky Way

by Kris Wiktor, Shutterstock [↗](#)

An example of a constellation net is the [D-STAR Round Table Net](#) [↗](#):

D-STAR Round Table is on a constellation of XRF/XLX Reflectors. To participate, you may connect to any one of the linked Reflectors: XRF002A, XRF310A, XRF555A, XLX313A, DMR XLX313/TG 4001 OR connect to a repeater that is linked to one of the reflectors.

From the paper, [XLX and XRF Reflectors, DMR, and use with DMRGateway](#) [↗](#), by John Fields, K6KD, of the D-STAR Round Table Forum:

The advantage for existing DMR users are portals into current XLX/XRF infrastructure (individual reflectors or groups of linked reflectors) either using new DMR only Talk Groups or Talk Groups with transcoding. The advantage for existing D-STAR users is the ability to access the XLX/XRF infrastructure using many high quality, low cost DMR radios.

Follow-up note (Nov 2017) – Thanks to instructions written by Craig Jungers, K7EXJ, in a document titled "Connecting your DMR radio to the D-STAR constellation," I was able to get Pi-Star DMRGateway set up

so that I was able to join into the [Kings of Digital](#) constellation with my DMR radio (thanks, Craig!). During the net, hams joined who were using both D-STAR and DMR radios. Sweet, this is progress! See the [X Reflector Directory](#) for more constellation nets.

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